

**ABSTRACT**

An etching apparatus for etching semi combustion samples may include one or more variable volume expansion chambers, two or more fixed volume expansion chambers, or combinations thereof in fluid communication with an etching chamber and  
5 a source of etching gas, such as xenon difluoride. The apparatus may further include a source of a mixing gas. An etching apparatus may also include a source of etching gas, an etching chamber in fluid communication with the source of etching gas, a flow controller connected between the source of etching gas and the etching chamber, and a vacuum pump in fluid communication with the etching chamber. A source for providing  
10 a gas by sublimation from a solid material is also provided, including a vacuum tight container and a mesh mounted in the interior of the vacuum tight container, wherein the mesh is adapted to receive and restrain the solid material.